HENSLOW ON THE SELF-FERTILIZATION OF PLANTS.—The Rev. George Henslow concludes from his studies on the structure of plants, that the prevailing views as to the necessity of cross-fertilization are too extreme. He claims that "Mr. Darwin's works have gone too far to strengthen the belief that intercrossing is absolutely necessary for plants; and that if self-fertilization be continued for lengthened periods the plants tend to degenerate and thence to ultimate extinction. This I believe to be absolutely false." Mr. Henslow arrives at the following conclusions in his article in the Popular Science Review: "1. The majority of flowering plants can, and possibly do, fertilize themselves. 2. Very few plants are known to be physiologically self-sterile when the pollen of a flower is placed on the stigma of the same flower. 3. Several plants are known to be morphologically self-sterile in that the pollen cannot, without aid, reach the stigma, but is effective on that of the same flower. 4. Self-sterile plants from both the above causes can become self-fertile. 5. Highly self-fertile forms may arise under cultivation. 6. Special adaptations occur for self-fertilization."

CONTRACTION OF LEAVES OF SENSITIVE PLANTS.—In Sir J. D. Hooker's recent address as President of the Royal Society, it is stated that Dr. Burdon Sanderson has for two years past been studying the true relations between the electrical disturbances followed by the shutting of the leaf valves of Dionæa, and the latent change of protoplasm which precedes this operation. He has found that though the mechanism of the change of form of the excitable parenchyma which causes the contraction is entirely different from that of muscular contraction, yet that the correspondence between the exciting process in the animal tissues and what represents this in the plant tissues appears to be more complete the more carefully the comparison is made; and that whether the stimulus be mechanical, thermal, or electrical, its effects correspond in each case. Again, the excitation is propagated from the point of excitation to distant points in the order of their remoteness, and the degree to which the structure is excited depends upon its temperature. Notwithstanding, however, the striking analogies between the electrical properties of the cells of Dionæa and of muscle-cylinders, Dr. Burdon Sanderson is wholly unable to admit with Prof. Munk that these structures are in this respect comparable.

ZOÖLOGY.[1]

DISCOVERY OF MALE EELS.—We are glad to state that finally what we believe to be genuine male eels have been discovered. In the January number of this journal it was announced by Prof. Packard that he had discovered male eels. A number of the supposed males were afterward again examined, by Prof.

[1] The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.

Packard and Dr. C. S. Minot, who were then led to conclude that the so-called male eels were immature females, and the mistake was corrected by Prof. Packard in the February NATURALIST. A large number of living eels were then examined by Messrs. Packard, Kingsley, Pierce and Minot without success, until at Prof. Packard's request Mr. Kingsley spent a few days at Wood's Holl, at the laboratory of the U. S. Fish Commission, in the last of February, examining living eels supplied by Mr. Vinal N. Edwards, by favor of Prof. Baird, U. S. Fish Commissioner. One hundred and ninety-three eels were there examined, and of these, three were found by Mr. Kingsley to be, in his opinion, males. His observations made on these living individuals, which were speared in a pond through the ice, are as follows:

"On February 18, 19 and 20, I examined one hundred and ninety-three eels, at Wood's Holl, and found three males, the testes of which agreed closely with Syrski's figures as reproduced in the U. S. Fish Commission Report for 1873–4 and 1874–5, p. 719. Although I made careful examination I could find no external characters to separate the sexes. The three males were each about seventeen inches long, while the females examined varied from about twelve inches to nearly three feet. This average length of males agrees closely with Syrski's (430 mm. in length). The principal criticisms I would make of his figures, or rather points of difference that I found, are that his enlarged figure showing the lobulation of the testis has the lobes far more crowded than they were in the specimens I examined. His drawing of the histological structure was greatly larger than what I supposed to be the same. His cells measure, according to the explanation, about $\frac{1}{440}$ of an inch on their major axis, while I saw nothing that could have been over $\frac{1}{4000}$ of an inch. The structure of the testis was similar to that which I have seen in the testes of the cod, perch, smelt, cat, deer, rooster, monkey, dog and man. On teasing it out under a Tolles one-fifth, I saw what I am confident were spermatozoa, although I could not distinguish the tails. The heads were oval and from one-half to one-third the size of those of the smelt, or about $\frac{1}{20000}$ of an inch in length; they had an independent motion, changing their position on the slide without reference to any current in the water in which the tissue was placed, and this motion was wholly different in its character from the vibrations of the Brownian movement."

Prof. Packard examined independently of and in company with Mr. Kingsley, preparations made by himself, and found scattered through the tissues, nucleated and nucleolated testis cells, of the same appearance as those of the animals above named, which were kindly obtained by Prof. Pierce. Moreover, Prof. Packard found two mother-cells, containing several immature nucleated spermatozoa. So that after the examination of about five hundred female eels and three males, we are glad to be able to affirm

the entire accuracy of Syrski's observations and figures, he being the first observer, so far as we are aware, who has discovered the male sex of the Italian eel. Which species of eel it was that Syrski examined is not stated. In making these investigations we have to acknowledge the aid of Prof. John Pierce, of Providence, in the use of a fine series of mounted histological specimens and lenses of high powers. He has worked jointly with us and is of our opinion as to the sex of the three males. Dr. Minot examined one of the three males, preserved in alcohol, and found as Freud and Brock had done previously, a folliclular structure, the follicles being filled with small spherical cells, which Dr. Minot considered to be probably immature spermatozoa, although the development could not be traced.—*A. S. Packard, Jr., and J. S. Kingsley.*

Breeding Habits of the Dace.—In the early part of June, 1878, an excellent opportunity offered itself for observing the breeding habits of the dace (*Rhinichthys atronasus*). Standing one afternoon upon one of the bridges crossing the river in this city, a nest of this fish was discovered in the stream below, it was about two feet in diameter, situated in running water from twelve to fifteen inches deep, and protected upon the upper side by a small root by which the current of the water was broken. The female would pass over the pebbles and deposit her spawn, while the male stood ready for an attack, and on the approach of an enemy would dart off like a flash in pursuit of the intruder. When no danger was near, and after the bed had been covered with spawn, the female would stand sentry until the male had passed over the eggs, and then both would proceed up the stream from four to ten feet or more, and taking a small pebble in their mouths, would quickly return and deposit them on the fecundated eggs, sometimes but one fish would go for pebbles, the other lingering near, thus layer after layer of impregnated eggs and pebbles were deposited one upon the other. These movements were watched for two days, when the water became muddy from the spring rains, and further observation was impossible. The wisdom displayed in these operations, and the wonderful exhibition of the instinct for the preservation of species is readily seen. The covering of the eggs retained them in their place, and at the same time protected them from being destroyed by other fishes who were constantly hovering about, like vultures watching an opportunity to devour them, while the interstices between the pebbles gave sufficient space to harbor the little *fry*, as soon as hatched, and to protect them until they, by their own instincts or by the assistance of the parent fish, were able to seek shelter beyond the reach of their enemies. I have no doubt in this manner all fresh-water *oviparous* fish deposit their spawn in (*not upon*) the pebble heaps we call their nests.—*W. H. Gregg, M.D., Elmira, N. Y.*

LARGE RATTLESNAKES.—Col. T. M. Bryan, of Vincenttown, N. J., writes us under date of Aug. 16th, that, "Rattlesnakes are very numerous with us just now, on account of the large amount of cedar swamp which is being cut. I obtained one which was six feet two inches long, with fourteen rattles and a button. Within the ensuing five days seven were offered, none, however, as long as the above mentioned, but one was five feet nine inches, and had fifteen rattles and a button."

SOUND-PRODUCING ORGANS OF THE CRICKET.—During some researches among the order of Orthopters, made by me the past fall, I made it a point to carefully investigate the means by which the stridulous calls of the family Saltatoria were produced. Latreille, in the "Animal Kingdom" of Cuvier, says of this family of leapers: "The males call their females by making a chirping noise, which is sometimes produced by rubbing an inner part of the wing-covers like a talc-like mirror, against each other with rapidity, and sometimes by a similar alternate motion of the hind thighs against the wings and wing-covers, the thighs acting the part of the bow of a violin." This description may be considered

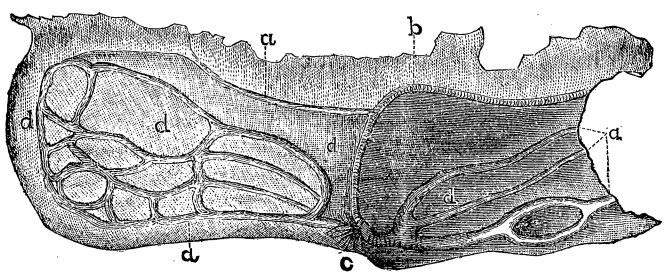


FIG. 1—Enlarged view of the under side of the wing-case of cricket; *a*, *a*, tracheal tube; *b*, ridge bearing vibratory flanges; *c*, slight protuberance; *d*, coriaceous membrane.

as relating more especially to the group in general, but in the case of the genus *Gryllus* (*Acheta* of English authors), of which I propose to speak, there is a special arrangement, a singular adaptation of means to ends.

It must be evident to all who are familiar with the notes produced by the cricket, that the extreme shrillness and penetrating power of their call could with difficulty be produced by the simple frictional movement of one unctuous "talc-like" surface over another. There are many different species the calls of which can be heard at the distance of several hundred feet, and one species, inhabiting Sicily (*G. megacephalus*) whose call has been distinguished at the distance of a mile.

This power to produce a penetrating tone, calls for a special

arrangement for that purpose. This arrangement we find on the under side of the wing-cases.

From a protuberance on the under-side of the coriaceous wing-case, about one-third the length of the case from its anterior extremity, and situated on the inner or sutural edge, there is a large tracheal tube which extends out laterally, thence forward and terminates at the juncture of the wing-case with the thorax. This tracheal tube forms, or extends through a ridge on the inferior surface of the case, which is in the form of a quadrant or crescent. On the ridge is situated a series of minute transverse vibratory flanges, resting upon edge and resembling, to a certain extent, the scales of a fish when scraped so as to cause them to stand erect. The base of each flange is thickened, the upper edge slightly blunted and recurved. The upper surface of the wing-case is squamous, so that when either case is drawn over the other, the series of vibratory flanges on the under side of one is made to pass rapidly over the scaly upper surface of the underlying case, in this manner producing the harsh creaking sound so familiar. By a greater or less rapidity of motion the insect can produce the variations of tone which are often observed. As the cases do not unite in the center of the back but each passes nearly to the opposite side of the body, the chain of vibratory flanges can be utilized to nearly its full length, before it becomes necessary to re-commence the stroke.

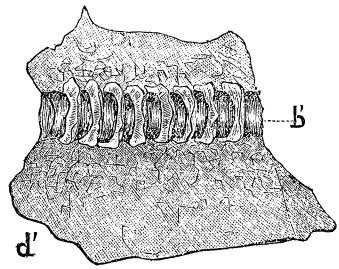


Fig. 2—*b'*, more enlarged view of the vibratory flanges; *d'*, scaly leather-like membrane.

When the ring-cases are at rest the two crescent shaped ridges are united so as to inclose a semicircular space in the center of the anterior portion of the cases. The leathery covering of this space is slightly elevated, forming a chamber underneath, which prevents the sound from being smothered in the folds of the second pair of wings, which lie directly beneath. The insect when about to produce its call usually assumes a fixed, statue-like position, with head lowered and posterior extremities slightly elevated, the cases forming an angle of twenty or thirty degrees with the abdomen.

The call is formed during the outward stroke of the cases, they being slightly separated when returning to the first position. I noticed that the field species, when calling from the mouth of its abode, stood with the head in the burrow and the extremities of the wings protruding from the opening, thus seeming to comprehend that their call could be heard to a greater distance if standing in this position than if in the reversed.

I have examined the wing-cases of a number of species and find that they all have a like arrangement to the one here described, although the shape of the flanges may vary, to a certain extent.—*Newton B. Pierce.*

THE LECANIUM OF THE TULIP TREE.—On page 218 of the "Revised Manual," in speaking of other sources than flowers from which bees collect sweets, I remark that I have seen the bees thick about a large bark-louse, which attacks and often destroys one of our best honey-trees. This is an undescribed species of the genus Lecanium.

In the summer of 1870 this louse, which, so far as I know, has never yet been described, and for which I propose the name *Lecanium tulipiferæ*—the Lecanium of the tulip tree—was very common on the tulip trees about the lawns of the Michican Agricultural College, at Lansing. So destructive were they that some of the trees were killed outright, others were much injured, and had not the lice, for some unknown reason, ceased to thrive, we should soon have missed from our grounds one of our most attractive trees.

Since the date above given, I have received these insects from many of the States, especially those bordering the Ohio river. In Tennessee they seem very common, as they are often noticed in abundance on the fine stately tulip trees of that goodly State. In the South this tulip tree is called the poplar, which is very incorrect, as it is in no way related to the latter. The poplar belongs to the willow family; the tulip to the magnolia, which families are wide apart.

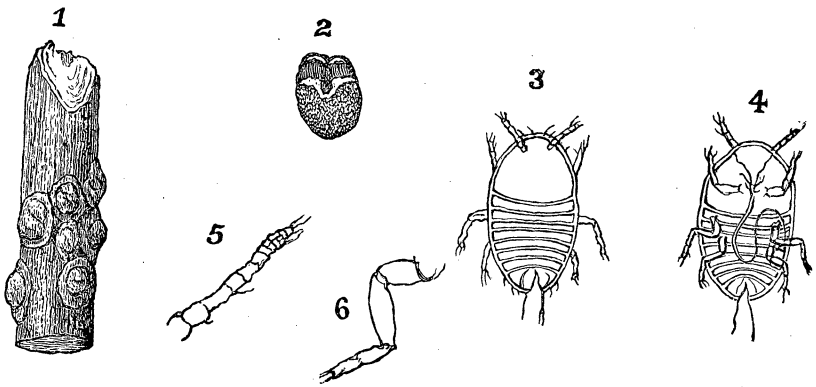
Wherever the tulip-tree lice have been observed, sucking the sap and vitality from the trees, there the bees have also been seen, lapping up a sweet juicy exudation which is secreted by the lice. In 1870 I observed that our tulip trees were alive with bees and wasps, even as late as August, though the trees are in blossom only in June. Examination showed that the exuding sweets from these lice were what attracted the bees. This was observed with some anxiety, as the secretion gives off a very nauseating odor.

The oozing secretions from this and other lice, not only of the bark-louse family (Coccidæ), but of the plant-louse family (Aphidæ), are often referred to as honey-dew. Would it not be better to speak of these as insect secretions, and reserve the name honey-dew for sweet secretions from plants, other than those which come from the flowers?

The fully developed insect, like all bark lice, is in the form of a scale (Fig. 1), closely applied to the limb or twig on which it works. This insect, like most of its genus, is brown, very convex above (Fig. 1), and concave beneath (Fig. 2). On the under side is a cotton-like secretion, common to all of the genus Lecanium, which serves to enfold the eggs. Underneath the species in question are two transverse parallel lines of this white down (Fig.

2). One of them, probably the anterior, is nearly marginal, and is interrupted in the middle, while the other is nearly central, and in place of the interruption at the middle, it has a V-shaped projection back or away from the other line. The form of the scale is quadrangular, and not unlike that of a turtle (Fig. 1). When fully developed it is a little more than three-sixteenths of an inch long, and a little more than two-thirds as wide.

Here at Lansing, the small, yellow, oval eggs appear late in August. In Tennessee they would be found under the scales in their cotton wrappings many days earlier. The eggs are one-fortieth of an inch long, and one-sixty-fifth of an inch wide. These eggs, which are very numerous, hatch in the locality of



their development, and the young or larval lice, quite in contrast with their dried, inert, motionless parents, are spry and active. They are oval (Figs. 3 and 4), yellow, and one twenty-third of an inch long, and one-fortieth of an inch wide. The eyes, antennæ (Fig. 5) and legs (Fig. 6) are plainly visible when magnified thirty or forty diameters. The nine-jointed abdomen is deeply emarginate, or cut into posteriorly (Fig. 3), and on each side of this slit is a projecting stylet or hair (Figs. 3 and 4), while from between the eyes, on the under side of the head, extends the long recurved beak (Fig. 4). The larvæ soon leave the scales, crawl about the tree, and finally fasten by inserting their long slender beaks, when they so pump up the sap that they grow with surprising rapidity. In a few weeks their legs and antennæ disappear, and the scale-like form is assumed. In the following summer the scale is full-formed and the eggs are developed. Soon the scale, which is but the carcase of the once active louse, drops from the tree, and the work of destruction is left to the young lice, a responsibility which they seem quite ready to assume.

In my observations I have detected no males. Judging from others of the bark-lice, these probably possess wings, and will never assume the scale form, though Prof. P. R. Uhler writes me

that apterous males are found among the Coccidæ, and that in all cases the males are very important in the determination of genera.

Remedies.—If valued shade or honey trees are attacked by these insatiate destroyers, they could probably be saved by discrete pruning—cutting off the infected branches before serious injury was done, or by syringing the trees with a solution of whale-oil soap—or even common soft-soap would do—just as the young lice are leaving the scales. It would be still better to have the solution hot. Whitman's Fountain Pump is admirable for making such applications.

Fig. 1 is slightly magnified; the others are largely magnified. The drawings were made from the objects by W. S. Holdsworth, a senior of the Michigan Agricultural College.—*A. J. Cook.*

Molting of the Horned Toad (*Phrynosoma douglassi* Gray).—This well-known species of horned lizard, or horned toad as it is more commonly known, is very widely distributed over the north-western portion of the United States. It appears especially abundant throughout the Bad Lands, and over the dry country between the Yellowstone and Musselshell rivers. During my visit to those regions with the Yellowstone Expedition of 1873, about fifty specimens were collected for the purpose of studying some of their habits. The first were met with in the Bad Lands during the first week in July, where a number of young were obtained, having probably been born about the middle of June, as indicated by their size and condition. After the main body of the expedition had crossed the Yellowstone river, a temporary camp was established, when quite a number of adult specimens were obtained upon which we discovered the first signs of molting. Those which had been collected a few days before now began to show similar evidences of shedding the skin. At first, small dry vesicles made their appearance over the back and sides, running along the horizontal rows of pyramidal scales forming the margins of the abdomen. In a day or two the vesicles would break and desquamation began, which continued over a period of about eight or ten days, the cephalic spines and the claws being the last to adhere. Immediately after the old skin had been removed, the process of which I assisted in several instances as far as possible, the new surface presented quite a brilliant appearance when closely viewed. The darker markings upon the dorsum appeared minutely sprinkled with black and brick red, while the lighter portions remained a pure olive of various shades.

After molting, the intensity of coloration is gradually lost, as the skin becomes more ashy or dusky, returning to the natural hue which the specimen bore previous to molting.

The specimens as far as observed, went through the process of molting from three to four weeks after the birth of the young. Mr. H. W. Henshaw (Surveys west of 100th meridian) has

observed the change, but from his observation he thought it occurred during the breeding season.

The specimens found on the prairie region flanking the Yellowstone river, were very light in color; those from the Bad Lands somewhat darker, while those obtained near, and on the Musselshell river were extremely dark, and one specimen was nearly black. In this individual the abdomen was darker than the backs of the specimens from the prairie districts. The abdominal scales were densely covered with black spray, sufficiently so as to give some of them a uniform color.

Dr. Yarrow[1] and Mr. Henshaw both say the coloration of the animal depends greatly upon the color of the soil where found, and this has been the result of my observations in Dakota and Montana, as well as in Arizona among other species of the same genus.

Dr. Yarrow[2] in speaking of the time that these reptiles may be kept alive without food, says he has never been able to keep them alive over four months. Of the total number collected in 1873, I brought sixteen to Pennsylvania, five of which survived until the following May. The state of torpidity which began in December may account for this to some extent, but at various times during the winter of 1873–4, I placed them near the heater to revive them temporarily for the purpose of showing them to inquisitive visitors; still this did not apparently affect them. In May, 1874, I placed them in the garden, and soon after being exposed to the sun they showed signs of exhaustion, difficulty of respiration, and finally died. They were considerably emaciated, and probably the state of debility, in addition to a humid atmosphere and sudden exposure to the hot rays of the sun was too much for them.—*W. J. Hoffman, M.D.*

ANTHROPOLOGY.[3]

PERFORATED SKULLS.—Rev. Stephen Bowers, Ph.D., recently discovered a burial place near Santa Barbara. Cal., which he explored in part. It yielded thirty or forty skeletons, serpentine bowls, a pipe, arrow-head, shell and bone ornaments, beads, etc. But the most singular feature was a nest of six skulls entirely separated from the other portions of the body, and buried under bowlders and fragmental rocks; five of these skulls were perforated near the apex (with one exception); the perforations were about three-fourths of an inch in diameter, and were doubtless made at death. He found other perforated skulls in the same cemeteries, but they were in too friable a condition for preservation.

ETHNOLOGY OF SOUTHERN CALIFORNIA.—Dr. Bowers spent several months during the year 1878 in ethnological explorations

[1] Bull. U. S. Geol. and Geog. Survey, IV, 1878, p. 286.

[2] Ibid, p. 287.

[3] Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.